Stranded wealth: rethinking the politics of oil in an age of abundance

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Abstract

Even if oil prices have recovered from their plunge in 2014, this article argues that the oil industry is unlikely to return to the status quo *ex ante*. Two profound shifts in technology and markets are dramatically changing the longer-term outlook for the oil industry. In the short term, traditional producers will feel persistent pressure from the shale revolution, a disruptive technology that has altered the cost curve and elasticity of oil supply. In the medium term, the industry must confront a structural slowdown and eventual peak in demand owing to innovation and evolving consumer preferences, related in part to concerns over climate change. Together, these shifts reflect a new energy order in which oil is no longer an exhaustible resource, new trading patterns emerge, and oil prices exhibit greater short-term volatility amid a long-term declining trend. These new rules of the game force us to reconsider some of the theories and concepts of the international political economy of oil. We flag three key political effects from these market shifts: (1) key oil-producing states face economic and political turmoil; (2) the Organization of the Petroleum-Exporting Countries (OPEC) cannot influence the price of oil in the long term by cutting output; and (3) power is redistributed in the international system.

Keywords: oil politics; shale revolution; climate policy; stranded assets

This is a pre-print version of the following article:
Van de Graaf, Thijs and Michael Bradshaw (2018). "Stranded wealth: Rethinking the Politics of Oil in an Age of Abundance," *International Affairs*, Volume 94, Issue 6, 1 November 2018, pp. 1309–1328, https://doi.org/10.1093/ia/iiy197.

* Michael Bradshaw's contribution to this article is based on research funded by the UK Research Councils (Grant nos EPSRC EP/L024756/1 and NERC NE/G007748/1) as part of the UK Energy Research Centre (UKERC).

Oil is the world's most traded commodity and the global economy's single most important energy source, so any significant change in its price can have far-reaching economic consequences. Large swings in the price of oil typically also have major knock-on effects on international relations because petroleum plays a pivotal role in shaping global and domestic politics.[1] Oil prices tend to generate headlines only when they go up, but downward movements can be just as significant in their effects.

Since the 1980s, the oil industry has experienced six episodes of significant oil price decline.[2] The most recent began in June 2014, when crude oil prices fell from more than US$110 a barrel to less than US$50 a barrel in the span of just six months. The price bottomed out at around US$27 a barrel in January 2016, before gradually recovering as OPEC and Russia coordinated efforts by producers to balance the market. In 2018, geopolitical factors—notably the impending reimposition of sanctions on Iran by the Trump administration and the political and economic crisis in Venezuela—have pushed prices up to around US$80.[3]

Many observers see the latest oil price fall and rise as no different from previous oil price cycles. The reports and projections of international institutions such as the International Energy Agency (IEA) suggest that there will be a sustained price recovery over the next few years because of deferred investment in upstream capacity, a gradual drawdown of inventories and continued growth in demand.[4] Thus, the supply cuts that oil producers from within and beyond OPEC have jointly implemented since January 2017 are only setting the stage for the next boom-and-bust cycle for oil markets.[5]

Yet, even if oil markets are starting to 'rebalance', this article argues that the oil industry is unlikely to return to the status quo *ex ante*. Two profound shifts in technology and markets are dramatically changing the longer-term outlook for the oil industry. In the short term, traditional producers will feel persistent pressure from the shale revolution, the advent of a disruptive

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[1] Susan Strange, *States and markets* (London: Bloomsbury, 1994); Gavin Bridge and Philippe Le Billon, *Oil* (Cambridge: Polity, 2017).

[2] John Baffes, M. Aykan Kose, Franziska Ohnsorge and Marc Stocker, *The great plunge in oil prices: causes, consequences and policy responses* (Washington DC: World Bank, March 2015).

[3] Oil price data were obtained from https://ycharts.com/indicators/brent_crude_oil_spot_price, 27 Sept. 2018. (Unless otherwise noted at point of citation, all URLs cited in this article were accessible on 3 Oct. 2018.)

[4] See e.g. IEA, *Oil 2017: analysis and forecasts to 2022* (Paris, 2017).

[5] Robert McNally, *Crude volatility: the history and the future of boom and bust oil prices* (New York: Columbia University Press, 2017).

technology that has altered the cost curve and elasticity of oil supply. The 'fracking' boom has demonstrated that oil and gas are not in imminent short supply, but rather characterized by abundance, even at relatively low prices. In the medium term, the industry must confront a structural slowdown and eventual peak in demand owing to innovation and evolving consumer preferences, related in part to concerns over climate change.[6] Together, these shifts reflect a new energy order in which oil is no longer an exhaustible resource, new trading patterns emerge, and oil prices exhibit greater short-term volatility amid a long-term declining trend.

These new rules of the game force us to reconsider some of the theories and concepts of the international political economy (IPE) of oil. The proposition of the 'resource curse', for example, has always been predicated on political pathologies resulting from the abundance and volatility of resource rents. But, as the impact of the 2014 oil price collapse illustrates, for many fossil fuel exporting countries future crises will result from the loss of those resource rents.[7] Similarly, the relative balance of power in the oil industry will shift in this new energy order. Whereas in the past oil companies (notably the 'Seven Sisters')[8] and host governments (notably those of OPEC countries) have attempted to set up distinct oil governance regimes, they will be less able to dictate the rules of the game in a market characterized by shrinking demand and abundant reserves. Finally, the notion that oil is an important component of 'structural power' and hegemony needs to be rethought if oil is increasingly displaced by low-carbon sources of energy in the global drive to decarbonize the economy. In such a world, oil-importing states will see economic and political advantage in promoting domestic renewable energy production at the expense of costly oil and gas imports.

This article proceeds as follows. The next section offers a review and a critique of the existing literature on the IPE of oil. In the following section, we develop our argument that the oil industry is being upended by two structural transformations in supply and demand. In the subsequent section, we reflect on how these secular shifts necessitate a rethink of key notions and theories related to the IPE of energy.

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[6] Kingsmill Bond, *2020 vision: why you should see peak fossil fuels coming* (London: Carbon Tracker Initiative, 2018).

[7] Siân Bradley, Glada Lahn and Steve Pye, *Carbon risk and resilience: how energy transition is changing the prospects for developing countries with fossil fuels* (London: Chatham House, 2018).

[8] The 'Seven Sisters' refers to a handful of giant western oil companies that dominated the global oil industry from 1928 to the 1960s: Royal Dutch Shell, British Petroleum, Gulf, Exxon, Mobil, Texaco and Chevron.

The IPE of oil: rentier states, market governance and structural power

Control over and trade in fossil fuels—particularly oil—has long been a cornerstone of the contemporary IPE. Petroleum is indispensable for the movement of people and goods, supplying no less than 93 per cent of the energy used for transportation across the world.[9] Without oil, international trade in merchandise would virtually come to a standstill. Moreover, the dollar denomination of international trade in oil helps to underpin the United States' monetary power and contributes to the accumulation of extensive 'petrodollar' reserves in oil-exporting states during boom times,[10] a major cause of global macroeconomic imbalances.[11] Petroleum companies are among the biggest and most-valued multinational corporations in the world, often wielding substantial political influence.[12] Oil also warps the domestic politics of producer countries and shapes global patterns of conflict and cooperation.[13]

Oil, in short, is critically linked to almost all major issues in IPE, including international security, trade, money, sovereign debt, tax and welfare, and global poverty and development. It is fair to say that the current global political economy is underpinned by a fossil fuel energy system that affords economic power and political influence to particular states and companies. The centrality of fossil fuels—particularly energy-dense oil—has created what DiMuzio calls a 'petro-market civilization'.[14] It is thus perfectly understandable that major theories and debates about the IPE of energy should be premised on the centrality of oil, including

[9] IEA, *Oil 2017*.

[10] David E. Spero, *The hidden hand of American hegemony: petrodollar recycling and international markets* (Ithaca, NY: Cornell University Press, 1999).

[11] Rabah Arezki and Fuad Hasanov, 'Global imbalances and petrodollars', *World Economy* 36: 2, 2012, pp. 213–32.

[12] Steve Coll, *Private empire: ExxonMobil and American power* (Harmondsworth: Penguin, 2012).

[13] Michael L. Ross, *The oil curse: how petroleum wealth shapes the development of nations* (Princeton: Princeton University Press, 2012); Jeff. D. Colgan, *Petro-aggression: when oil causes war* (Cambridge: Cambridge University Press, 2013).

[14] Tim DiMuzio, 'Capitalizing a future unsustainable: finance, energy and the fate of market civilization', *Review of International Political Economy* 19: 3, 2012, pp. 363–88.

controversies over the resource curse,[15] oil and democracy,[16] rentier states,[17] peak oil,[18] energy security,[19] private and national oil companies,[20] and resource wars.[21]

Many of these debates have their roots in the oil-related turbulence of the 1970s. Energy markets have changed considerably since then, but academic scholarship has not kept pace.[22] It prompted Robert Keohane, one of the pioneers in the field of IPE, to observe that 'the demand for analysis of the causes and consequences of oil price fluctuations surely exceeds by far the supply of serious scholarship on the subject'.[23] Here we seek to heed Keohane's call for more research into the structural changes that occur in the international oil market, and how they challenge some of the key concepts that have underpinned much of the current work on the global political economy of energy.

In doing so, this article ties into three different strands in the literature. First, it relates to literature on 'rentier states', that is, states that rely heavily on revenue from the export of natural resources.[24] Many oil rentier states have been plagued by poor economic performance, low

[15] Ross, *The oil curse*.
[16] Timothy Mitchell, *Carbon democracy: political power in the age of oil* (London: Verso, 2011).
[17] e.g. Alexander A. Cooley, 'Booms and busts: theorizing institutional formation and change in oil states', *Review of International Political Economy* 8: 1, 2001, pp. 163–80.
[18] e.g. Jörg Friedrichs, *The future is not what it used to be: climate change and energy scarcity* (Cambridge, MA: MIT Press, 2013)
[19] e.g. Andrew Cheon and Johannes Urpelainen, 'Escaping oil's stranglehold: when do states invest in energy security?', *Journal of Conflict Resolution* 59: 6, 2015, pp. 953–83.
[20] e.g. Paul Stevens, 'National oil companies and international oil companies in the Middle East: under the shadow of government and the resource nationalism cycle', *Journal of World Energy Law and Business* 1: 1, 2008, pp. 5–30; Jonas Meckling, Bo Kong and Tanvi Madan, 'Oil and state capitalism: government–firm coopetition in China and India', *Review of International Political Economy* 22: 6, 2015, pp. 1159–87.
[21] e.g. Colgan, *Petro-aggression*.
[22] Kathleen J. Hancock and Vlado Vivoda, 'International political economy: a field born of the OPEC crisis returns to its energy roots', *Energy Research and Social Science* 1, March 2014, pp. 206–16; Thijs Van de Graaf, Benjamin K. Sovacool, Arunabha Ghosh, Florian Kern and Michael T. Klare, 'States, markets, and institutions: integrating international political economy and global energy politics', in Thijs Van de Graaf, Benjamin K. Sovacool, Arunabha Ghosh, Florian Kern and Michael T. Klare, eds, *The Palgrave handbook of the international political economy of energy* (Palgrave Macmillan, 2016), pp. 3–44.
[23] Robert O. Keohane, 'The old IPE and the new', *Review of International Political Economy* 16: 1, 2009, pp. 34–46 at p. 41.
[24] Hossein Mahdavy, 'The patterns and problems of economic development in rentier states: the case of Iran', in M. A. Cook, ed., *Studies in the economic history of the Middle East: from the rise of Islam to the present day* (Oxford: Oxford University Press, 1970), pp. 428–67; Rolf Schwarz, 'The political economy of state-formation in the Arab Middle East: rentier states, economic reform, and democratization', *Review of International Political Economy* 15: 4, 2008, pp. 599–621.

levels of democracy and civil war.[25] This so-called 'resource curse' continues to be intensely debated, but very few scholars have contemplated the implications for this line of thinking of structural shifts in the global supply and demand of oil, or for that matter the implications of the shale revolution and its different infrastructure needs and production profile.[26] An exception is Sinn's thesis of the 'green paradox', which states that climate policies such as carbon taxes may end up increasing emissions since they could lead owners of fossil fuel resources to accelerate extraction.[27] Likewise, Friedrichs and Inderwildi propose the concept of the 'carbon curse' to describe the phenomenon whereby fuel-rich countries appear doomed to high carbon intensity.[28] A recent study by Chatham House has paid particular attention to the implications of commitments to address climate change and decarbonization for developing countries moving into fossil fuel exploitation.[29] Beyond these examples, however, the resource curse debate is still largely disconnected from broader issues of climate change and decarbonization.

Second, this analysis connects to the literature on stabilizing and managing volatile (commodity) markets. Most of the work in this area has focused on commodity cartels such as the Seven Sisters and OPEC.[30] There has been little attention so far within the mainstream IPE field to the governance and regulation of commodity (derivative) markets.[31] The emerging literature on global energy governance has focused predominantly on the role of international institutions such as the IEA and the G20 in governing the energy question writ large, and tells

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[25] Jeffrey D. Sachs and Andrew M. Warner, *Natural resource abundance and economic growth*, working paper no. 5398 (Cambridge, MA: National Bureau of Economic Research, 1995); Michael L. Ross, 'Does oil hinder democracy?', *World Politics* 53: 3, 2001, pp. 325–61; Paul Collier and Anke Hoeffler, 'Greed and grievance in civil war', *Oxford Economic Papers* 56: 4, 2004, pp. 536–95; Richard M. Auty, *Sustaining development in mineral economies: the resource curse thesis* (London: Routledge, 1993).

[26] George Shambaugh and Aaron Taylor, 'The energy revolution: a resource blessing or a resource curse?', *Georgetown Journal of International Affairs* 16: 2, Summer–Fall 2015, pp. 206–16.

[27] Hans-Werner Sinn, *The green paradox: a supply-side approach to global warming* (Cambridge, MA: MIT Press, 2012).

[28] Jörg Friedrichs and Oliver R. Inderwildi, 'The carbon curse: are fuel rich countries doomed to high CO_2 intensities?', *Energy Policy* 62, November 2013, pp. 1356–65.

[29] Bradley et al., *Carbon risk and resilience*.

[30] Edith Penrose, *The large international firm in developing countries: the international petroleum industry* (Cambridge, MA: MIT Press, 1968); Anthony Sampson, *The Seven Sisters: the great oil companies and the world they shaped* (New York: Viking, 1975); Ian Skeet, *OPEC: twenty-five years of prices and politics* (Cambridge: Cambridge University Press, 1988); Dag Harald Claes, *The politics of oil-producer cooperation: the political economy of global interdependence* (Boulder, CO: Westview, 2002); Jeff D. Colgan, 'The emperor has no clothes: the limits of OPEC in the global oil market', *International Organization* 68: 3, 2014, pp. 599–623.

[31] Jennifer Clapp and Eric Helleiner, 'International political economy and the environment: back to the basics?', *International Affairs* 88: 3, May 2012, pp. 485–501.

us little about the specific mechanisms of governance in today's oil market.[32] This leaves largely unexplored the question of how the oil market can be managed in the light of structural shifts on both the demand and the supply side.

Third, it connects to scholarship on the relationship between energy and the global distribution of power. Susan Strange has argued that 'energy is the *sine qua non* for the exercise of power in the international political economy' because it is so essential for the pursuit of wealth and security.[33] The structure of international oil markets—characterized by the strong position of American corporations, North America's relative energy self-sufficiency, and the dollar denomination of oil trade—continues to underpin the global hegemony of the United States.[34] Structural shifts in the oil market could, therefore, transform economic and power dynamics in the global political economy. Some studies have examined the impact of the shale revolution,[35] but far fewer scholars have examined the geopolitics of a shift away from oil to renewable energy and other energy sources.[36]

The old oil order and forces of disruption

Oil has never been subject to a comprehensive international regime. Instead, it has been subject to several 'imposed orders', designed to advance the interests of one or just a few dominant actors.[37] The Seven Sisters oil cartel, set up in the period between the two world wars, was the first such order. It consisted of a series of vertically integrated oil companies, linked by formal cartel arrangements. This order began to unravel in the context of decolonization. It was replaced by the OPEC-led order in the late 1960s, when oil-producing states succeeded in wresting control of production and prices from the international majors. Alarmed by the 1973 oil shock, the United States took the lead in setting up an oil consumers' regime centred on the IEA. This order came to be based on liberal markets and progressive financialization.

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[32] Thijs Van de Graaf and Jeff D. Colgan, 'Global energy governance: a review and research agenda', *Palgrave Communications*, 2016, DOI: 10.1057/palcomms.2015.47.

[33] Strange, *States and markets,* p. 209.

[34] Simon Bromley, *American hegemony and world oil: the industry, the state system and the world economy* (University Park: Pennsylvania State University Press, 1991).

[35] e.g. David H. Dunn and Mark J. L. McClelland, 'Shale gas and the revival of American power: debunking decline?', *International Affairs* 89: 6, Nov. 2013, pp. 1411–28.

[36] Daniel Scholten, ed., *The geopolitics of renewables* (New York: Springer, 2018).

[37] Oran R. Young, *Resource regimes: natural resources and social institutions* (Berkeley: University of California Press), p. 105.

Since the turn of the millennium, this liberal order has gradually ceded ground to a new order, driven in large part by China's thirst for oil imports and characterized by a comeback of the state and a bilateralization of energy relations. In this state capitalist order, international oil relations are again framed predominantly in geopolitical terms such as 'scarcity' and 'access to fields'. When oil prices reached their all-time high in July 2008, there was a widespread belief that peak oil had finally arrived. It was assumed that soaring energy demand from China and other rising powers, coupled with the rapid depletion of conventional oil fields, would only intensify the scramble for oil and gas reserves. The projections of ever-rising energy demand added to the belief that oil prices would keep on rising, and that the power of OPEC and other big producers such as Russia would only grow.[38]

Two major shifts now have the potential to overturn that view: the shale or fracking revolution; and the looming global shift away from hydrocarbons. A key difference between the two trends is that the shale oil revolution is an ongoing trend, while peak oil demand has not (yet) materialized. We now consider each trend, before discussing the new oil order that will ensue.

Shale shocked: the fracking revolution

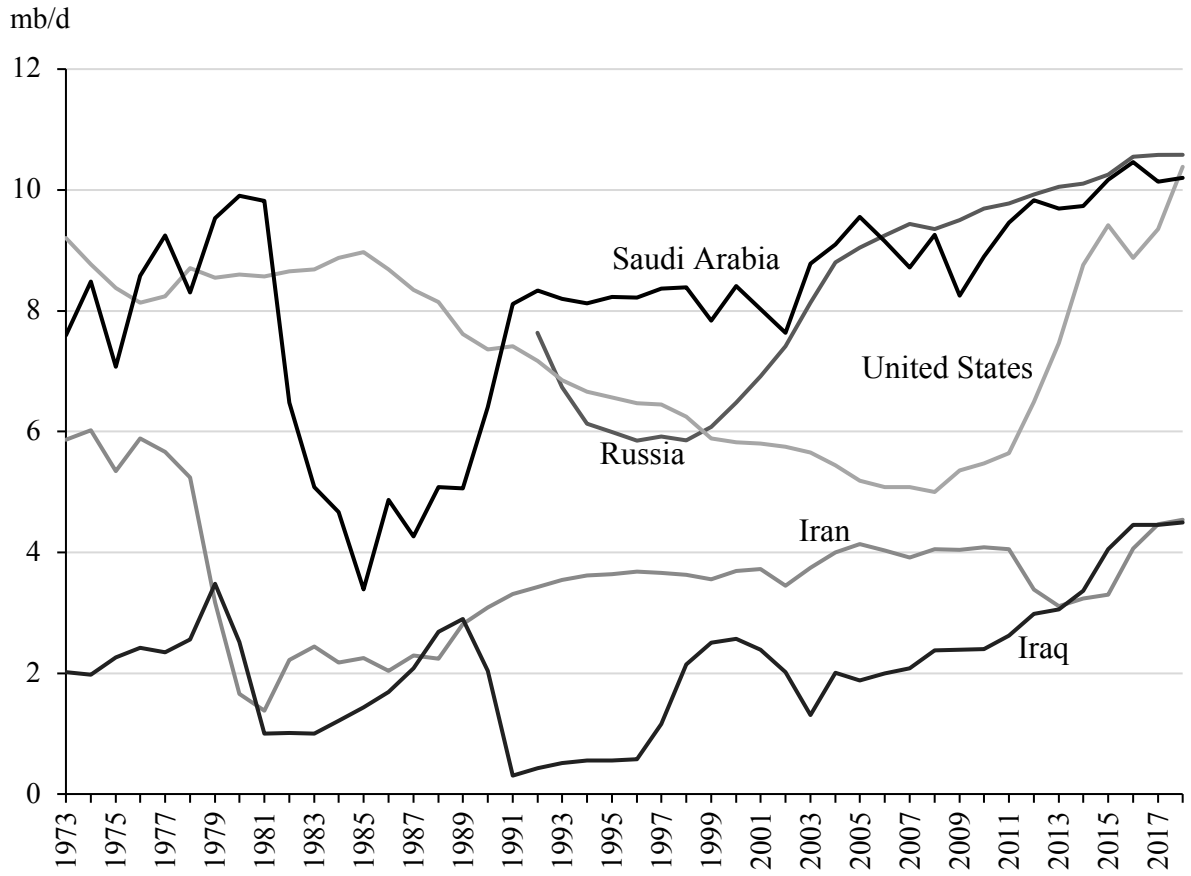
The shale or fracking revolution has been a game changer for international oil and gas markets. It involves a combination of three techniques, each of which had been developed separately, that made it possible for companies to free the gas and oil molecules that are trapped in layers of shale rock. They are: horizontal drilling, seismic imaging, and the ability to use hydraulic pressure to split, or 'fracture', the rock to release trapped hydrocarbons. The unique mineral ownership system of the United States, whereby the subsurface rights are in private hands for private gain, served as a key enabling condition, which allowed the fracking revolution to develop extremely quickly. After remaining flat for around a decade, US natural gas production suddenly took off in 2007. By 2009, the United States had overtaken Russia as the world's largest gas producer.[39] In the same year, fracking also pushed US oil production up again after

[38] James D. Hamilton, *The changing face of world oil markets*, working paper no. 20355 (Cambridge, MA: National Bureau of Economic Research, 2014); Michael T. Klare, *Rising powers, shrinking planet: the new geopolitics of energy* (New York: Metropolitan Books, 2009); Michael T. Klare, *The race for what's left* (London: Picador, 2012).

[39] BP, *Statistical review of world energy 2017* (London, 2017).

a decade-long decline (see figure 1). In July 2018, the US produced almost 11 million barrels of oil per day (mb/d), an all-time high.[40]

Figure 1: Yearly crude oil production of selected countries, 1973–2018



Source: US Energy Information Administration, *Monthly Energy Review*, 8 Oct. 2018, tables 11.1a and 11.1b, https://www.eia.gov/totalenergy/data/monthly/#international.
Note: Figure for 2018 is based on average for period January-June.

The shale boom has created global ripple effects. The US Congress lifted the 40-year-old export ban on crude oil in December 2015, and in February 2016 the United States also began exporting cargoes of liquefied natural gas (LNG). Other countries also have large oil- and gas-rich shale deposits, and many of them are eager to develop these reserves. It is not possible, however, simply to cut and paste the US shale success in other countries. For instance, China, Argentina and Algeria are estimated to have larger shale gas resources than the United States,

[40] US Energy Information Administration (EIA), 'US field production of crude oil', 2018, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRFPUS2&f=A.

but their production might be constrained by a range of issues, such as insufficient access to water.[41] As yet, then, it remains uncertain how far the shale revolution will spread beyond the United States.[42]

The unexpected shale boom was part of a broader surge in oil and gas production. Just as the oil shocks of the 1970s had ushered in the development of new oil provinces, notably the North Sea and the Gulf of Mexico, so the price rises after 2000 led to an increase in exploration spending.[43] This flurry of exploration activity has resulted in major discoveries of new conventional oil and gas fields. The increased spending on exploration also shifted the frontiers of drilling, notably to the deeper offshore, the Arctic and the Canadian tar sands. More recently, some of the established Middle Eastern producers, most notably Iraq and Iran, have increased their production after decades of wars and sanctions (see figure 1). The global pool of available liquid fuels has further expanded thanks to increased production of biofuels (now supplying the equivalent of 1.7 mb/d) and natural gas liquids (contributing as much as 16.2 mb/d):[44] none of this has anything to do with oil extraction, but it all adds further to the oil glut.[45]

The shale oil boom stands out, however, because it has changed the cost curve and elasticity of oil supply. The fracking industry operates on a much shorter investment cycle than the conventional oil industry: upfront costs are relatively low; lead times and payback times are short. Unlike wells in conventional reservoirs, which decline at around 6 per cent per year, tight oil wells[46] typically decline by about 60 per cent in the first year and 25 per cent in the second year of production, although shale producers are able to extract more oil from new wells as drilling techniques and technology improve.[47] There is no real exploration process to speak of

[41] EIA, 'World shale resource assessments', 2015, https://www.eia.gov/analysis/studies/worldshalegas/.
[42] Roberto F. Aguilera and Marian Radetzki, *The price of oil* (Cambridge: Cambridge University Press, 2016); R. Quintin Grafton, Ian G. Cronshaw and Michael C. Moore, *Risks, rewards and regulation of unconventional gas* (Cambridge: Cambridge University Press, 2017); Thijs Van de Graaf, Tim Haesebrouck and Peter Debaere, 'Fractured politics? The comparative regulation of shale gas in Europe', *Journal of European Public Policy* 89: 6, Nov. 2013, pp. 1411–28
[43] EIA, 'Today in energy: global upstream oil and gas spending continues to favor exploration and development', 2016, https://www.eia.gov/todayinenergy/detail.php?id=16011.
[44] IEA, *World Energy Outlook 2017* (Paris, 2017), p. 15.
[45] Natural gas liquids are light hydrocarbons that exist in liquid form underground and are produced together with natural gas and recovered in separation plants or processing plants.
[46] In the US, oil extracted from shale rock with fracking is typically referred to as 'light, tight oil'. We use it interchangeably with the term 'shale oil'.
[47] EIA, 'Today in energy: initial production rates in tight oil formations continue to rise', 2016, https://www.eia.gov/todayinenergy/detail.php?id=24932.

because the location and broad characteristics of the main 'plays' are well known. The time from an investment decision to actual production is measured in months, rather than years, making the light tight oil industry far nimbler and more responsive to price signals than its conventional counterpart.[48] The result is that shale oil could keep a lid on oil prices in the years ahead, which might keep those prices, and thereby oil revenues for exporters, lower for longer. In such a world, cost competitiveness will be critical, and oil companies making investment decisions with 20- to 30-year time horizons will need to be wary of saddling themselves with too much high-cost production.

The shale industry has also been remarkably resilient in the face of falling prices since mid-2014. While the number of active drilling rigs declined precipitously as oil prices fell, production responded more slowly: it took more than a year, until November 2015, to halt the shale industry's year-on-year growth in output. Some fracking companies had hedged future production in derivatives markets, thus locking in higher prices, while others were required to go on producing to keep their leases or to meet interest payments.[49] Still, even though some shale companies have gone bankrupt, and most of them have very high levels of debt,[50] overall the sector has succeeded in cutting down costs thanks to technological innovation and streamlined production processes.[51] The productivity gains are related to the fact that fracking is more akin to a standardized, manufacturing-like process, unlike the one-off, large-scale engineering projects that characterize many conventional oil enterprises.[52]

The IEA expects US tight oil output to grow by 8 million barrels per day from 2010 to 2025, making this the 'highest sustained period of oil output growth by a single country in the history of oil markets'.[53] Growth on that scale would allow the United States to become a net oil exporter from the late 2020s. However, the IEA also expects that over around the same period,

[48] IEA, *World Energy Outlook 2015* (Paris, 2015).
[49] McNally, *Crude volatility*.
[50] Dietrich Domanski, Jonathan Kearns, Marco Lombardi and Hyun Song Shin, 'Oil and debt', *BIS Quarterly Review*, March 2015, pp. 55–65.
[51] It is interesting to note that easy access to capital was the essential 'fuel' that enabled the fracking revolution. The shale boom would not have happened in the same way had global interest rates not been close to zero, with central banks using large-scale quantitative easing to stimulate the economy in the wake of the Great Recession of 2007–2008. See Spencer Dale, 'New economics of oil', paper presented to Society of Business Economists Annual Conference, London, 13 Oct. 2015, https://www.bp.com/content/dam/bp/pdf/speeches/2015/new-economics-of-oil-spencer-dale.pdf.
[52] Dale, 'New economics of oil'.
[53] IEA, *World Energy Outlook 2017*, p. 26.

US tight oil will begin to plateau and non-OPEC production as a whole to fall back.[54] The upshot is that the market becomes increasingly reliant on the Middle East to balance supply and demand—that is, at least, if demand grows as projected; which is far from certain, as we argue below.

The spectre of peak oil demand

Historically, oil demand has grown in step with economic output. Since 1965, oil consumption has risen from about 30 mb/d to close to 100 mb/d in 2018.[55] Most scenarios project world oil demand to continue growing for the next two decades. The IEA's 'new policies' scenario, for instance, foresees an increase of 10 per cent in world oil demand from 2016 to 2040; and under a 'business-as-usual' scenario, the IEA even forecasts an increase in world oil demand of 24.8 per cent.[56] The energy outlooks of OPEC and international oil companies all project similar demand growth (see table 1). The only exceptions are 'normative' scenarios that take climate goals into account, such as the IEA's 'sustainable development' scenario[57] or Shell's 'Sky' scenario,[58] which project a decline in oil demand.

[54] IEA, *World Energy Outlook 2017*.
[55] BP, *Statistical review of world energy 2018*.
[56] IEA, *World Energy Outlook 2017*, p. 79.
[57] IEA, *World Energy Outlook 2017*.
[58] Shell, *Sky scenario* (The Hague, 2018), https://www.shell.com/energy-and-innovation/the-energy-future/scenarios/shell-scenario-sky.html.

Table 1: Projected change in oil demand under different scenarios

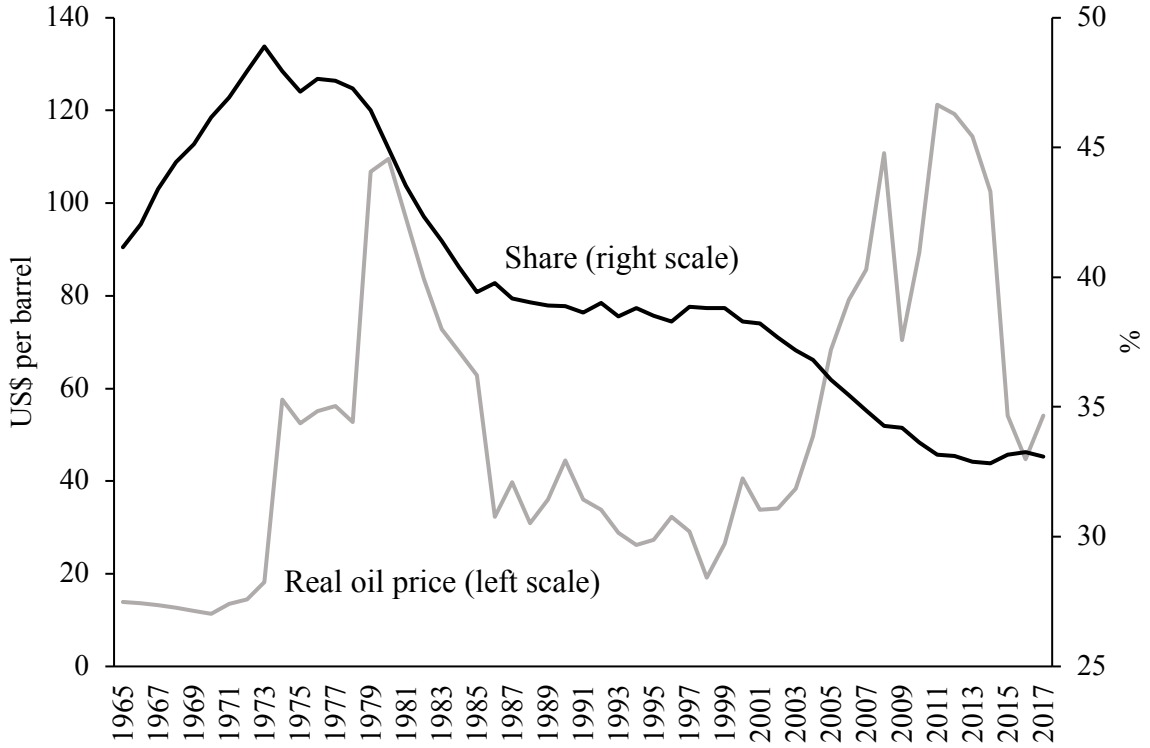
Institution	*Scenario/source*{?}	*Projection Period*	*Change over period (%)*	*Compound average annual growth rate (%)*
Shell	Oceans scenario	2010–40	+28.1	+0.94
IEA	Current policies	2016–40	+24.8	+0.9
BP	*Energy Outlook 2035*	2015–35	+15	+0.75
ExxonMobil	*Outlook for Energy – A View to 2040*	2015–40	+18	+0.72
OPEC	Reference case, *World Oil Outlook 2017*	2015–40	+16.4	+0.6
IEA	New policies scenario	2016–40	+10.1	+0.4
Shell	Mountains scenario	2010–40	+9.0	+0.3
IEA	Sustainable development scenario	2016–40	−24.7	−1.2
Shell	Sky scenario	2016–2100	−73.3	−1.51

Sources: BP, *Energy outlook 2035* (London, 2014); ExxonMobil, *The outlook for energy: A view to 2040* (Irving, 2016); IEA, *World Energy Outlook 2017* (Paris, 2017); OPEC, *World Oil Outlook* (Vienna, 2017); Shell, *New Lens Scenarios: A Shift in Perspective for a World in Transition* (The Hague, 2013)-; Shell, *Sky scenario* (The Hague, 2018).

It would be wrong, however, to conclude that oil demand will continue to grow unabatedly as it did in the past. To begin with, every single projection in table 1 shows a slowdown in oil demand growth below the historical annual rate of 2.27 per cent recorded between 1965 and 2016.[59] The secular trend is that the global economy is decoupling from oil consumption, with less oil burned per unit of GDP. This decline in oil intensity is related to advances in energy efficiency and oil substitution in sectors such as power generation, buildings and industry. As a result, the share of oil in total primary energy consumption dropped from 48.7 per cent in 1973 to 33.3 per cent in 2016 (see figure 2). In other words, the world has been switching away from oil for decades.

[59] BP, *Statistical review of world energy 2017*.

Figure 2: Oil's share in world energy consumption and real oil prices, 1966–2017



Note: Real oil price in constant 2017 US$.

Source: BP, *Statistical Review of World Energy*, June 2018.

Of course, oil could lose market share but still grow in absolute terms, just as coal did relative to oil and gas in the twentieth century.[60] Yet future oil demand growth hinges on a small number of countries (80 per cent of incremental demand comes from China and India alone) and a shrinking set of sectors (petrochemicals, aviation, shipping and freight) where growth is supposed to offset declines in all—and we mean *all*—other countries and sectors.[61] As a result, such projections are very sensitive to growth expectations for these few remaining growth markets. If only one country or sector does not grow as assumed, or if the global economy remains mired in secular stagnation,[62] this could change the picture for the oil industry as a whole. With China's economy shifting gears,[63] and the International Maritime Organization

[60] BP, *Statistical review of world energy 2017*.

[61] IEA, *World Energy Outlook 2017*.

[62] Laurence H. Summers, 'Reflections on the "new secular stagnation hypothesis"', in Coen Teulings and Richard Baldwin, eds, *Secular stagnation: facts, causes and cures* (London: CEPR press, 2014), pp. 27–40.

[63] Fergus Green and Nicholas Stern, *China's new normal: structural change, better growth, and peak emissions*, policy brief no. 2015 (London: Grantham Research Institute on Climate Change and the Environment, 2015).

(IMO) and International Civil Aviation Organization adopting standards for the aviation and shipping sectors, the risks to oil demand are tilted to the downside. In 2016, for example, the IMO set a global sulphur limit on fuel oil that will take effect in 2020, and in 2018 it also adopted a strategy to reduce carbon emissions from the shipping sector by at least 50 per cent compared with 2008 levels by 2050. While the first regulation will shift demand towards middle distillates (thus representing a challenge to Middle Eastern oil producers, which pump high-sulphur crude), the latter strategy implies that new vessels capable of running on fuels other than oil will need to start coming into service in the 2030s (thus representing a challenge to all oil exporters).

Even if these key markets grow as assumed, technological and market shifts might start to challenge the dominant position of oil much more quickly than many assume. The transportation sector, oil's key stronghold, is widely believed to be on the cusp of a major transformation, with the advent of electric vehicles (EVs), automated driving and ride-sharing. The full impact of such changes remains to be seen—for example, the use of self-driving cars might lead to more miles logged, which might increase demand for fuels—but the potential for disruptive change is there, especially if the three models are combined. Efficiency improvements in internal combustion engines could take a bite out of oil demand even before EVs come into the picture, and 'modal shifts' (to non-car based transportation means like public transport or electric bicycles) should be added into the equation as well. India, for example, has the opportunity to pursue an alternative urban transit model that would allow it to leapfrog the US car-centric model. There are also signs that attitudes towards car ownership are changing with the emphasis on different models for mobility, particularly in large cities, with talk now of 'peak car' in the OECD.[64] Oil demand in the petrochemical sector is vulnerable too, since the products it produces (e.g., plastics, cosmetics, fertilizers and synthetic cloths) can also be manufactured from natural gas and biomass-based feedstock. There is also a growing backlash against (single-use) plastics following revelations that there will be more plastic than fish in the world's oceans by 2050, and that microplastics are finding their way into the food chain, posing significant threats to health.[65]

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[64] Stefan Nicola and Elisabeth Behrmann, *Peak car and the end of an industry*, Bloomberg, 17 Aug. 2018, https://www.bloomberg.com/news/articles/2018-08-17/-peak-car-and-the-end-of-an-industry.

[65] Ellen MacArthur Foundation, *The new plastics economy: rethinking the future of plastics*, Jan. 2016, https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics; Peter Dauvergne, 'The power of environmental norms: marine plastic pollution and the politics of microbeads,' *Environmental Politics* 27: 4, 2018, pp. 579–97, https://doi.org/10.1080/09644016.2018.1449090.

Energy scenarios are notorious for missing disruptive trends. Few organizations predicted the dramatic fall in costs of alternative energy technologies such as photovoltaic solar, wind and batteries that have occurred over the past couple of years.[66] In fact, organizations such as the IEA have received fierce criticism for systematically underestimating the potential of solar and wind energy. While it is difficult to predict the future, the adoption of new technologies typically follows an S-curve, starting from an initial period of slow growth before reaching a tipping point of fast adoption.[67] Moreover, recent studies have challenged the mainstream view that energy transitions are necessarily slow, protracted affairs.[68] Research from the IMF shows that, if the displacement of horses by motor vehicles in the early twentieth century provides any guide, EVs could make up 93 per cent of the vehicle stock by 2040.[69]

Most projections show a much slower rate of adoption, but a small change is often enough to wreak havoc on the incumbents. It took just an 8 per cent increase in market share for renewables to strip €100 billion from the value of European utilities between 2008 and 2013, and a 10 per cent loss of market share in the power sector to push the US coal industry to the brink of collapse.[70] In this sense, it is worth noting that investors and insurers are increasingly aware of the risks that fossil fuel assets pose. Shareholders have made oil corporations discuss the risks to their strategies posed by climate policy, major funds have committed to divest from fossil fuels, and oil firms have been sued in court for contributing to climate change. These and other actions may signal a global normative turn against fossil fuels, reminiscent of the way that norms have historically shifted about slavery, women's suffrage, whaling and tobacco.[71] The possibility of such a trend may undercut the oil industry's social licence to operate and—to the extent that large investors are coming on board—also hinder the industry's access to finance.

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[66] UN Environment Programme (UNEP) and Bloomberg New Energy Finance (BNEF), *Global trends in renewable energy investment 2017* (Frankfurt: FS–UNEP Collaborating Centre for Climate and Sustainable Energy Finance, 2017).

[67] J. C. Fisher and R. H. Pry, 'A simple substitution model of technological change', *Technological Forecasting and Social Change* 3, 1971, pp. 75–88.

[68] Benjamin K. Sovacool, 'How long will it take? Conceptualizing the temporal dynamics of energy transitions', *Energy Research and Social Science* 13, March 2016, pp. 202–15.

[69] Reda Cherif, Fuad Hasanov and Aditya Pande, *Riding the energy transition: oil beyond 2040* (Washington DC: IMF, 2017).

[70] Luke Sussams and James Leaton, *Expect the unexpected: the disruptive power of low-carbon technology* (London: Carbon Tracker Initiative, Grantham Institute for Climate Change and the Environment, 2017).

[71] Fergus Green, 'Anti-fossil fuel norms', *Climatic Change*, 2018, DOI: 10.1007/s10584-017-2134-6.

As these norms shift, government policies to mitigate the financial and environmental costs of oil consumption can also make a huge dent in global oil demand. A prime example is the recent curtailing of oil subsidies in countries such as China, India and Indonesia, the main engines of oil demand growth in Asia over the coming years.[72] Policies to combat air pollution and mitigate climate change could also favour a transition away from oil, and diesel in particular. France, the Netherlands and the United Kingdom have recently announced a complete phase-out of conventional combustion engines over the next two decades, while China and India have declared their intent to follow this example.[73] Security of supply concerns, coupled with a desire to become a forerunner in the clean energy race, the commercial race to become a leading supplier of clean energy technology, could further erode the status of oil in countries such as India and China.

Together, structural changes in technology and markets are slowing down the demand for oil, which is heading for a peak, though the date at which this will actually be reached is highly uncertain. Moreover, a demand peak could very well be followed either by a long plateau or by a sudden plunge.[74] Ultimately, however, if countries live up to the pledges made in the Paris Agreement to keep warming 'well below 2°C', oil demand must peak in the 2020s and decline at an increasing rate in the subsequent years.[75] To keep the temperature rise below 2°C, around 30 per cent of global oil reserves are deemed 'unburnable', even in a scenario that assumes widespread adoption of carbon capture and storage (CCS).[76] Figure 3 shows the geographical distribution of unburnable oil reserves up to 2050 in a 2°C scenario with CCS, based on field production costs. The implications are huge: Canada should not touch any of its tar sands, the US should leave its tight oil reserves in the ground and the Arctic should be left entirely unexploited.

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[72] Thijs Van de Graaf and Mathieu Blondeel, 'Fossil fuel subsidy reform: an international norm perspective', in Jakob Skovgaard and Harro van Asselt, eds, *The politics of fossil fuel subsidies and their reform* (Cambridge: Cambridge University Press, 2018).

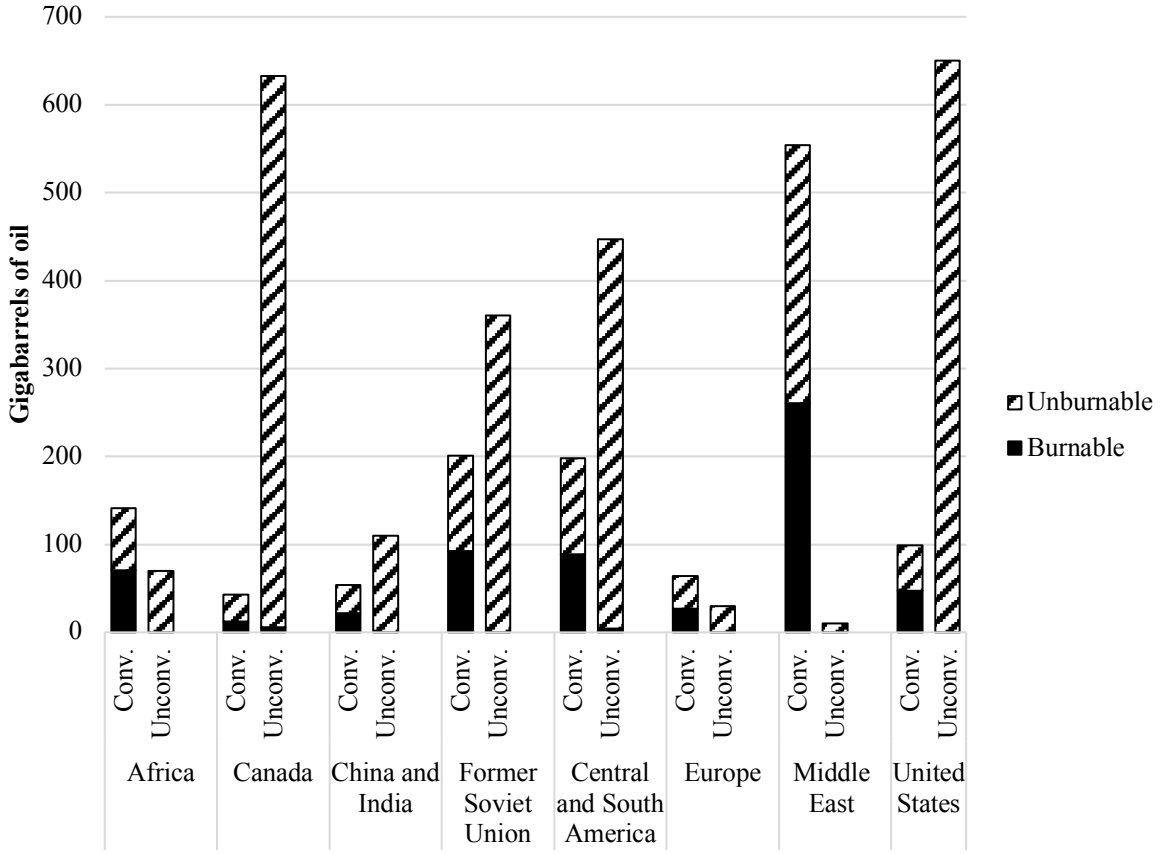
[73] IEA, *World Energy Outlook 2017*, p. 165.

[74] Spencer Dale and Bassam Fattouh, *Peak oil demand and long-run oil prices*, Energy Insight no. 25 (Oxford: Oxford Institute for Energy Studies, 2018). See also a video by Andrew J. Stanley, Sarah Ladislaw, Frank A. Verrastro and Alan Siemenski, *The future of oil demand: peak, plateau or plummet* (Washington DC: Center for Strategic and International Studies, 2018), https://www.csis.org/analysis/future-oil-demand-peak-plateau-or-plummet.

[75] IEA, *World Energy Outlook 2017*.

[76] Christophe McGlade and Paul Ekins, 'The geographical distribution of fossil fuels unused when limiting global warming to 2°C', *Nature* 517: 7533, 2015, pp. 187–90.

Figure 3: How much oil is unburnable in a 2°C scenario before 2050?



Note: 'Conv.' and 'Unconv.' stand for conventional and unconventional oil resources, respectively.

Source: Authors' creation based on data from Christophe McGlade and Paul Ekins, 'The geographical distribution of fossil fuels unused when limiting global warming to 2°C', *Nature* 517: 7533, 2015, pp. 187–90.

The new oil order

The emergence of shale oil, together with major transformations on the demand side, imply that established beliefs about how the oil market functions are out of date. This in turn requires the principles and toolkits that were used to analyse the oil market in the past to be radically revised. In this section we reflect on how the rules of the game have changed from the perspective of oil producers. While private oil companies such as ExxonMobil, BP, Chevron, Shell and Total are certainly affected by the shale revolution and structural shifts in demand,[77] over 90 per cent

[77] See e.g. Paul Stevens, *International oil companies: the death of the old business model* (London: Chatham House, 2016).

of global oil reserves are in state control, so our focus on oil-exporting states is warranted. We flag three key political effects from these market shifts: (1) key oil-producing states face economic and political turmoil; (2) OPEC cannot influence the price of oil in the long term by cutting output; and (3) power is redistributed in the international system.

Resource governance in petrostates

The first principle that needs to be reconsidered is the assertion that oil is an exhaustible resource. True as that may be from a geological perspective, the shale-driven transformation of oil supply and the looming reversal in oil demand growth make it highly unlikely that all of the world's oil will ever be consumed. While OECD governments would thus earn less from the taxation of oil—according to OPEC data, more than 50 per cent of the oil price paid in the OECD consists of taxes[78]—the oil companies and exporting countries would be hit hardest. If oil consumption is ultimately constrained, there is no longer a strong reason to expect the relative price of oil to increase over time.[79] The oil industry can thus end up with lower future revenues from their assets (the bursting of the 'carbon bubble'), capital investments in oil infrastructure that cannot be recovered because of reduced demand or reduced prices ('stranded assets') and existing oil reserves that are left unexploited ('unburnable oil reserves').[80]

For decades, oil-exporting countries have lived under the basic assumption of Hotelling's rule of optimal extraction of exhaustible resources: the owner of oil can leave the resource in the ground as a physical asset or sell it and invest the proceeds in the financial markets. The upshot is that the price of an exhaustible resource has to grow at a rate that follows the interest rate.[81] The spectre of oil demand destruction, however, upends that view; producers might find out some day that oil under the ground is less valuable than oil produced and sold in the short term. This might encourage them to pump as much as they can, as fast as they can, to serve a shrinking market.[82] While it makes sense for oil producers to speed up the rate of extraction, this is at best 'a short-term strategy to finance exploding deficits', which 'does nothing to improve growth

[78] OPEC, 'Who got what from a litre of oil in 2015', http://www.opec.org/opec_web/en/data_graphs/333.htm.
[79] Dale, 'New economics of oil'; Dieter Helm, *Burn out: the endgame for fossil fuels* (New Haven, CT: Yale University Press, 2017).
[80] IEA and International Renewable Energy Agency (IRENA), *Perspectives for the energy transition: investment needs for a low-carbon energy system* (Paris and Abu Dhabi: OECD, IEA, IRENA, 2017), p. 106.
[81] Harold Hotelling, 'The economics of exhaustible resources', *Journal of Political Economy* 39: 2, 1931, pp. 137–75.
[82] Thijs Van de Graaf and Aviel Verbruggen, 'The oil endgame: strategies of oil exporters in a carbon-constrained world', *Environmental Science and Policy* 54, December 2015, pp. 456–62.

and development prospects'.[83] Only a few producers can ramp up production in the short term and most will probably shy away from increased investment in exploration, which is typically made in anticipation of rising, not falling, demand.[84]

Of course, natural resource wealth has not always led to good fortune for oil-rich countries. In theory, the loss of such oil rents could make the resource curse go 'into reverse'.[85] The problem, however, is that the transition is likely to be painful. Very few of the major oil exporters have followed the rule of Hartwick, which states that subsoil assets (e.g., oil reserves) should be transformed into reproducible surface assets (e.g., human or physical capital) to preserve long-term per capita consumption.[86] According to a World Bank study, in the period from 1980 to 2005 no country that got more than 10 per cent of its GDP from oil and gas rents has followed the Hartwick rule and diversified its economy, except Malaysia.[87] Oil-producing countries such as Venezuela, Nigeria, Brazil and Russia have experienced severe economic distress and political turmoil, related in part to the decline in oil revenues after 2014.[88] To the extent that oil prices return to a lower level for longer in the face of slowing demand in the 2020s, this pattern is likely to spread, with severe risks for international geopolitical stability.

The vulnerability of major oil producers to lower oil revenues in an age of abundance is a function of their oil-rent dependence, demography, economic base, history and political system. Saudi Arabia faces a difficult transition in the long run. It has some of the highest dependency rates on oil rents, in the order of 37 per cent of its GDP in the period 2012–2015.[89] Keeping its young and growing population content will be a major challenge for the Al-Saud dynasty if oil revenues stay lower for longer.[90] Iran, by contrast, has a much broader economic base, a longer tradition of trading, and lower fertility rates. Like Iraq, its oil production is well below its

[83] Frederick Van der Ploeg, 'Fossil fuel producers under threat', *Oxford Review of Economic Policy* 32: 2, 2016, pp. 206–22 at p. 219.
[84] Robert D. Cairns, 'The green paradox of the economics of exhaustible resources', *Energy Policy* 65, February 2014, pp. 78–85.
[85] Van der Ploeg, 'Fossil fuel producers under threat'.
[86] John M. Hartwick, 'Intergenerational equity and the investing of rents from exhaustible resources', *American Economic Review* 65: 5, 1977, pp. 972–74.
[87] World Bank, *The changing wealth of nations: measuring sustainable development in the new millennium* (Washington DC, 2011), p. 11.
[88] Baffes et al., *The great plunge in oil prices*.
[89] Thijs Van de Graaf, 'Battling for a shrinking market: oil producers, the renewables revolution and the risk of stranded assets', in Daniel Scholten, ed., *The geopolitics of renewables*, pp. 97–121.
[90] Helm, *Burn out*, pp. 119–20; Meghan L. O'Sullivan, *Windfall: how the new energy abundance upends global politics and strengthens America's power* (New York: Simon & Schuster, 2017).

potential owing to years of sanctions,[91] which, ironically, might turn out to be an advantage in the long run. Russia is also a major loser from the shift away from oil. Even though it is less dependent on oil revenues than Saudi Arabia and some of the smaller Gulf states, its endemic corruption, autocratic tendencies and lack of a globally competitive industrial base will leave the Russian economy in a precarious state when oil revenues dry up.[92]

OPEC's role in oil market governance

A second way in which the rules of the game will change is that the market mechanism—rather than OPEC or any other institution—will play a greater role in balancing oil supply and demand.[93] Since the 2014 oil price drop many commentators have asked whether there is still a 'swing producer' that can absorb unexpected variations in demand or supply. Prior to the 1970s, the Texas Railroad Commission had effectively operated as the world's swing producer. In the 1970s, Texas passed the baton on to OPEC, and especially Saudi Arabia. The instrument through which Riyadh has managed to fulfil this role is 'spare capacity', usually defined as the volume of production that can be brought online within 30 days and sustained for at least 90 days.[94] Spare capacity acts as a buffer against price volatility and supply shocks, leading the IMF to describe it as a global public good.[95]

However, OPEC's historic decision, taken in November 2014, of 'letting the market work' led to a decline in OPEC's effective spare capacity from more than 2 mb/d in 2014 to just over 1 mb/d in 2016**{9}**.[96] That decision, or rather non-decision, has been described as 'an epochal moment' and 'the most important decision OPEC has taken since October 1973', when the organization took over the pricing of its crude from international oil companies.[97] The erosion of OPEC's spare capacity meant that Saudi Arabia was no longer willing to play the role of market manager as it had done in the past. Instead, Riyadh wanted to shift the burden of balancing the market to other, high-cost producers. The change led the IEA to make the

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[91] Helm, *Burn out*, pp. 123–4.
[92] Helm, *Burn out*, p. 142.
[93] O'Sullivan, *Windfall*.
[94] EIA, 'What drives crude oil prices?', n.d., https://www.eia.gov/finance/markets/crudeoil/supply-opec.php.
[95] IMF, *World Economic Outlook 2005* (Washington DC, 2005).
[96] EIA, 'Short-term energy outlook', June 2017, https://www.eia.gov/outlooks/steo/report/global_oil.cfm; Ali Al Naimi, speech at CERAWeek, Houston, Texas, 23 Feb. 2016, http://fingfx.thomsonreuters.com/gfx/ce/1/482/482/NAIMI%20AT%20CERA%20WEEK.pdf.
[97] Mohamed Ramady and Wael Wahdi, *OPEC in a shale oil world* (New York: Springer, 2015), p. 3.

remarkable statement in 2016 that 'we are living in perhaps the first truly free oil market we have seen since the pioneering days of the industry'.[98]

This situation led to much speculation about OPEC's demise as a cartel,[99] and the possibility of US shale producers taking over the role of 'swing producer'. As noted above, the shale industry has some unique characteristics that make it more responsive than the traditional oil industry to price changes. However, the North American frackers are unable, by themselves, to assume the mantle of global swing producer. US oil production is made up of hundreds of independent companies, each of which is first and foremost seeking to maximize profits and offer a return to its shareholders. They respond to price impulses, and do not coordinate their production policies—indeed, to do so would be illegal under US anti-trust laws. And, finally, US shale production cannot swing as fast as Saudi spare capacity.[100]

In 2017, however, the IEA concluded that 'the great experiment' had ended and that 'market management' had returned.[101] Indeed, in late 2016 OPEC countries and eleven other producers crafted the most comprehensive output reduction agreement since 2008. The stated aim was to take 1.8 mb/d of oil production out of the market. In the face of resilient shale production in the United States, the production cuts have been extended until June 2018. Just like the 2008 production cuts, however, the current extended OPEC plus non-OPEC agreement is more crisis management than market management. It is aimed at reducing the high level of inventories to rebalance the market in the short term; not at waging war against shale producers or avoiding a potential peak and subsequent decline in demand.[102] In the course of 2017, Khalid Al-Falih, Saudi Arabia's energy minister, repeatedly declared that OPEC will do 'whatever it takes' to balance the oil market, a reference to the famous words of Mario Draghi, the chairman of the European Central Bank**{10}**.[103]

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[98] IEA, *Medium term oil market report* (Paris, 2016), p. 12.

[99] Thijs Van de Graaf, 'Is OPEC dead? Oil exporters, the Paris Agreement and the transition to a post-carbon world', *Energy Research and Social Science* 23, January 2017, pp. 182–8.

[100] McNally, *Crude volatility*.

[101] IEA, *Oil 2017*, p. 3.

[102] McNally, *Crude volatility*.

[103] At a speech in London on July 26, 2012, European Central Bank (ECB) president Mario Draghi said that 'the ECB is ready to whatever it takes to preserve the euro'. This speech marked an important turning point in the crisis of the Eurozone.

Despite the ostensible shifts in tactics (from the 'pump-at-will' policy in 2014 to the 'whatever-it-takes' strategy of late 2017), OPEC's role has not fundamentally changed. The belief that OPEC can act as a market manager was never correct, because cheating is endemic in the self-proclaimed cartel.[104] OPEC, or rather Saudi Arabia, has only a certain amount of power to stabilize the market in response to *temporary* shocks to either demand or supply.[105] At a speech in March 2017, Khalid Al-Falih explained that OPEC can intervene in the market only to address 'short-term aberrations' rather than 'long-term structural imbalances'.[106] In other words, OPEC will be unable to prop up the oil price in the long term by cutting output. As oil is being traded in a more competitive market environment, petrostates will face more pressure to diversify. Of course, timing is everything here. As we noted at the outset, the current resurgence in the oil price can be seen as the upturn of the next business cycle as markets tighten owing to a lack of investment since 2014, aggravated by geopolitical factors. However, there remains lurking in the background the impact of climate policy as an existential threat to future fossil fuel demand. How quickly that threat becomes reality remains to be seen; and there is no consensus on the speed of the energy transition.[107]

Geopolitical power shifts

The new oil order has the potential to redistribute power in the international system. The United States is already a clear winner. Thanks to surging shale production, it is the only major power that is moving steadily towards energy self-sufficiency by the 2020s. While this is not tantamount to autarky, and will not insulate the US from the vagaries of the international market as oil is priced globally and the US still imports a lot of oil, it nevertheless brings both strategic and economic benefits. Low energy prices have directly benefited the US economy, and the domestic energy revolution has also helped drive a decline in the US current account deficit, because of the reduced need for hydrocarbon imports.[108] In strategic terms, the new shale-driven energy abundance has paved the way for international sanctions that eventually brought Iran back to the negotiating table and, ultimately, to the signing of an agreement over its nuclear

[104] Colgan, 'The emperor has no clothes'.
[105] Dale, 'New economics of oil'.
[106] Khalid Al-Falih, 'Preparing for the future: the imperative of investment', speech at CERAWeek, Reuters, 7 March 2017, http://www.reuters.com/article/ceraweek-saudi-speech-idUSL2N1GK132.
[107] Bassam Fattouch, Rahmatallah Poudineh and Rob West, *The rise of renewables and energy transition: what adaptation strategy for oil companies and oil exporting countries?* (Oxford: Oxford Institute for Energy Studies, 2018).
[108] Dale, 'New economics of oil'.

programme.[109] The cushion of shale oil, along with the collapse of Libyan and Venezuelan oil output, also allowed the Trump administration in 2018 to pull back from the nuclear agreement with Iran and impose sanctions—although its decision to do so has created tensions between the EU and its other European allies, who remain major energy importers.

As the United States is moving towards 'energy independence', or 'energy dominance', which the Trump administration has set as a goal, global oil trade flows are shifting to the Asian market, itself dominated by a few heavyweight national oil companies with considerable market power. Firms such as the Korea National Oil Company, the Indian Oil and Natural Gas Corporation Limited and the China National Offshore Oil Corporation are state-owned companies that operate transnationally not primarily in search of markets but in search of resources.[110] Over time, OPEC and other major exporters are thus likely to be confronted with a more oligopolistic market. The fierce bidding rivalry in 2016 between Russia's Rosneft and Saudi Aramco over the acquisition of Indian refiner Essar, a state-of-the-art plant in the world's fastest-growing fuel market, is illustrative in this respect.

As Asia becomes increasingly dependent on the Middle East, it becomes more vulnerable to disruptions in what is arguably already the most volatile region in the world. Rising oil consumers such as China and India are not likely to see the US military domination of the Persian Gulf in entirely benign terms.[111] Indeed, it is likely that the Chinese-led creation of the Asian Infrastructure Investment Bank and the associated 'Belt and Road' Initiative, which has been a priority of President Xi Jinping's rule, stem in no small measure from such energy security concerns.[112]

Much more than any other Great Power, China is banking on clean energy technologies to compete with US and Russian oil and gas and make China the renewable energy superpower

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[109] O'Sullivan, *Windfall*.

[110] David G. Victor, David R. Hults and Mark C. Thurber, *Oil and governance: state-owned enterprises and the world energy supply* (Cambridge: Cambridge University Press, 2012).

[111] Joshua Rovner and Caitlin Talmadge, 'Hegemony, force posture, and the provision of public goods: the once and future role of outside powers in securing Persian Gulf oil', *Security Studies* 23: 3, 2014, pp. 548–81.

[112] Zha Daojiong and Robert Sutter, 'Outlooks on Chinese energy security vulnerabilities,' in Mike M. Mochizuki and Deepa M. Ollapolly, eds, *Energy security in Asia and Eurasia* (London: Routledge, 2017), pp. 36–59.

of the twenty-first century.[113] It is already the world's largest producer, exporter and installer of solar panels, wind turbines, batteries and electric vehicles. For China, the energy transition is a way to gain industrial advantage in sectors such as automotives where they have hitherto struggled to compete on a global basis. State Grid, China's largest state-owned company, has plans to create a global supergrid, linking every continent with undersea transmission cables and powering the world with clean energy.[114] China's infrastructure diplomacy could be as important to shaping twenty-first-century geopolitics as the protection of sea lanes was to the hegemony of the United States in the twentieth century.

Conclusions

Many in the industry wish to explain the recent drop in oil prices as just the latest dip in a traditionally cyclical market. It may well be the case, as the IEA suggests, that the current period of low oil prices and reduced investments will lead to a tighter market in a few years' time.[115] Yet it is important to separate out the short-term challenges created by growing supply, weakened demand and very high inventories from the long-run structural challenges represented by the shale revolution and climate policy, with its associated behavioural and technological changes. The latter, we argue, represent the beginnings of the end of the age of oil.

The shale revolution essentially means that there is a lot of oil available on the global cost curve in the region of US$50–60 per barrel. Thus, even if Asian demand surges, which itself is uncertain, the market can find equilibrium at a lower price than was previously the case, notwithstanding geopolitical interventions. At the same time, since the Paris Agreement, and despite President Trump's decision to withdraw the United States from that agreement,[116] there is a global commitment to address climate change.[117] In this context, the key uncertainty is not whether global oil demand will peak, but how soon it will peak and how quickly demand will fall thereafter. Again, the oil industry may wish to claim that peak demand is still decades away

[113] Amy Myers Jaffe, 'Green giant: renewable energy and Chinese power', *Foreign Affairs*, March–April 2018, https://www.foreignaffairs.com/articles/china/2018-02-13/green-giant.
[114] For more information on the project, see the dedicated website: http://www.geidco.org/html/qqnycoen/index.html.
[115] IEA, *Oil 2017*.
[116] Peter Dombrowski and Simon Reich, 'Does Donald Trump have a grand strategy?' *International Affairs* 93: 5, Sept. 2017, pp. 1013–38.
[117] Johannes Urpelainen and Thijs Van de Graaf, 'United States non-cooperation and the Paris agreement', *Climate Policy* 18: 7, 2017, pp. 839–51, DOI: 10.1080/14693062.2017.1406843.

and that the world will still need lots of oil and gas; but the reality is that shareholders, financial markets and central banks are all taking this challenge seriously now.

As we noted at the beginning of this article, current thinking in IPE—both that which explicitly addresses energy issues and that which is unconsciously based on implicit assumptions about the role of the current fossil fuel system—is predicated on a narrative of fossil fuel 'scarcity' and competition, and often conflict, to secure access at a 'reasonable' price. The combined forces of unconventional oil and climate change policy, and the associated behavioural and technological change, represent an existential threat to the future of the fossil fuel system. The coal industry has been the first to face significant demand destruction, but in the coming decades both the oil and the gas industries are likely to face the same challenge.

This offers huge opportunities for the field of IPE. Just as 'business as usual' is the most unlikely of future energy scenarios, so 'theorization as usual' may be found wanting in the emerging new energy age. The perspective of a gradual demise of the oil industry opens up a wide new research agenda. Is it possible for rentier states to diversify their economic base, given that only a few petrostates have managed to truly break free from their dependence on oil revenues? How will this affect state–society relations in such rentier states? Are we likely to see more intrastate conflict as the shift away from oil accelerates, and how will global geopolitical relations be affected? Will the growing financialization of oil make the oil world more vulnerable to financial shocks, and vice versa? This is only the beginning of a long list of questions that IPE scholars ought to address.